# VI. Research and Extension

**Commission Recommendations:** The Commission recognized that the traditional focus of Federal research and extension programs is on improving farm productivity with technological improvements. However, the Commission explicitly recommended that USDA's Research, Education, and Economics (REE) agencies shift resources to improving farm profitability through technologies and strategies that optimize farm management skills, reduce capital and operating costs, produce higher valued products, and capture a larger share of the consumer dollar.

Specifically, the Commission recommended that by 2002, at least two-thirds of the Agricultural Research Service research portfolio should consist of projects that contribute to income-earning capacity and competitiveness of small farms.

## AGENCY HIGHLIGHTS

### Agricultural Research Service (ARS)

The 8,000 employees of the Agricultural Research Service (ARS) operate a nationwide research network to meet the needs of the producers and consumers of agricultural goods and services. This includes promoting food safety and good nutrition and economic stability in rural communities and protecting the environment. While much of the Agency's research is useful to farms and ranches of all sizes, some findings are particularly useful to limited-resource producers. Some examples of such research results include the following work in horticulture, aquaculture, and forage-livestock production.

- **Paper Mulch for Weed Control:** Weed control is one of the greatest obstacles to vegetable production in the southeastern United States. Many small farmers need control options that do not rely on chemical inputs. Researchers at the U.S. Horticultural Research Center in Fort Pierce, Florida, have been working with Novovita, Limited Liability Company (LLC), a small company based in North Carolina, and researchers at North Carolina State University and the University of Florida to develop new formulations of paper mulch that are highly effective in managing weeds.

In initial studies, even nutsedge has been suppressed; it is one of the region's most difficult to control weeds. They have conducted on-farm trials with small-scale growers of strawberries and melons using sheets of paper that can be applied by hand. They have also tested a hydramulch that is applied as a sprayable liquid on melons and bell peppers. Not only might this hydramulch help small farmers control weeds, it would be appropriate for home garden use and landscaping.

These mulches are a novel use of a waste product that is composed mainly of fifth-generation cotton waste. Research continues to improve weed control through newer hydramulch formulations and to make the application technology more manageable for small farmers.

- **Hawaiian Fruit-Fly Control Program Provides Opportunities for Small Farms**: Fruit flies have been devastating Hawaiian agriculture for almost 100 years and have forced many small farms to abandon important crops. The Hawaiian fruit fly area wide pest management project has resulted in the first successful program to control these destructive pests. The project is led by a of partnership of ARS, the Hawaii Department of Agriculture, the University of Hawaii Cooperative Extension Service and local communities, APHIS, and other research, regulatory, and government agencies.

The integrated pest management (IPM) strategy being implemented is a combination of techniques, developed mainly by ARS, specifically adapted to Hawaii. The targeted fruit flies (melon, Oriental, Mediterranean, and Malaysian) attack more than 400 different fruits and vegetables. The 285 cooperating growers in this program, representing 6,200 acres across the major islands of Hawaii, have been able to cut conventional pesticide use by 75-90 percent while reducing fruit fly infestation from 30-40 percent to less than 5 percent. The program is expanding in Hawaii and throughout the Pacific Basin (for example, French Polynesia, Fiji, Vanuatu, Guam, and the Northern Mariana Islands).

- **Alternatives to Methyl Bromide for Cut Flower Production:** Many small farms in south Florida specialize in producing flowers that are cut and used by florists across the United States. These small farms have become dependent on methyl bromide for control of nematodes, weeds, and other soil borne pests. These field-grown plants face pest problems similar to those associated with vegetable production in Florida, but the diversity of the products grown requires a slightly different approach that must often be grower-specific.

Many flower growers produce their crops on small acreages and are unable to justify commercial fumigation. Researchers at the U.S. Horticultural Research Laboratory in nearby Fort Pierce, Florida, are currently cooperating with smaller acreage producers to test new chemicals being developed at the laboratory. Growers could apply the new chemicals using a drip irrigation system or by injection into the soil. The researchers are testing several methods and refining them to accommodate both large and small growers.

- **Improving Grapevine Sustainability:** Grape plants colonized with arbuscular mycorrhizal (AM) fungi have improved nutrient uptake and productivity. ARS scientists at Davis, California have found that found that cover crops and weeds growing on the vineyard floor are an important source of AM fungi. By improving our understanding of the biology of AM fungi, the scientists have developed vineyard floor management practices to promote greater colonization of grapevines. This results in more efficient use of nutrients by the grapes and this benefits producers by reducing fertilizer inputs and nutrient runoff into the environment.

- **New Strawberry Variety:** "Ovation," a new strawberry variety developed by scientists at the ARS Fruit Laboratory in Beltsville, Maryland, has high yield, excellent fruit size and quality,

and exceptional vigor. This variety is expected to replace the current late-season standard for growers from the Mid-Atlantic northward because of its extremely late fruiting season, plant vigor, and over-all quality. These growers are mainly on smaller farms, often with a diversified crop base. This variety is also highly resistant to red stele root rot, one of the most limiting factors for cost-effective production.

- **Yields Higher for Sunshine Bass:** Farmers have had very little objective information to use in selecting between the two commercial crosses of hybrid striped bass raised in the United States. In cooperation with a regional producer of hybrid striped bass, scientists at the Harry K. Dupree (HKD) Stuttgart National Aquaculture Research Center in Stuttgart, Arkansas, determined pond production characteristics (feed consumption, feed conversion rate, growth, and fillet yield) of the two crosses. Results indicated that fillet yield was 3 percent greater for sunshine bass (white bass female x striped bass male) than for palmetto bass (striped bass female x white bass male). No other production characteristics were significantly different. So sunshine bass can be more profitable to grow than palmetto bass because they have flesh that is more edible.

- **Low-cost control of bird predation:** A major economic loss for the aquaculture industry is predation by double-crested cormorant and other birds. Working with six privately owned catfish producers in southeastern Arkansas, ARS scientists at the HKD Stuttgart National Aquaculture Research Center in Stuttgart, Arkansas, evaluated a low-cost, physical barrier system for deterring fish-eating birds. The technique limited cormorant access to aquaculture ponds by 4 to 10 fold, and when they did land on the ponds, the duration of their stay was reduced. Other fish-eating birds were deterred as effectively, and in some cases, there was complete exclusion. This economical, non-lethal method has already been adapted by at least 10 major catfish farms and their losses have been greatly reduced.

- **Increasing profit opportunities from hair sheep:** When compared to wool sheep, hair sheep breeds are better at adapting to a variety of climates, using low-quality forages, reproducing prolifically, and not needing shearing. But we lack information on how different hair sheep breeds perform on low-cost finishing diets based on forages. ARS and university researchers in Beaver, West Virginia, and Petersburg, Virginia, evaluated three hair breeds (Barbados Blackbelly, Katahdin, and St. Croix) finished on low-cost hay diets supplemented with corn. They found that Katahdin had a 25 percent higher average daily gain and used dietary protein 13 percent better than St. Croix and Barbados Blackbelly lambs. The increased protein use and weight gains for Katahdin hair sheep allow producers to reduce feeding costs and optimize profitability in a fast-growing niche market.

To identify appropriate sheep breeds for the more subtropical South, ARS scientists at Booneville, Arkansas and the University of Arkansas compared the growth and carcass traits of three hair sheep breeds (Dorper x St. Croix, and Katahdin) and one traditional wool breed (Suffolk). The best results in terms of animal performance, carcass muscularity, and quality for lambs weaned at 60 days and managed on a finishing ration till harvest at 180 days of age came from a Dorper x St. Croix cross.

■ **Self-seeding annual grasses:** Limited-resource farmers often cannot use highly productive annual forage grasses because of the annual reseeding costs. ARS scientists at Langston, Oklahoma evaluated alternative harvest practices for annual ryegrass to determine the best harvesting dates for forage yields while leaving sufficient grass to mature and produce adequate seed for self-seeding the next year's stand. They found that the greatest seed deposition resulted in July after a mid-April harvest. The maximum forage yield resulted from mid-May harvesting, which did not produce enough seed for natural reseeding. Farmers need to evaluate the tradeoffs between seed production and forage yield in deciding when to harvest.

■ **Improving Forages for Livestock Production:** New forage varieties that improve forage quality and yields without requiring additional inputs can increase small-farm profitability. To speed up the development of improved grasses for rehabilitating and improving rangelands, ARS scientists at Logan, Utah are using molecular techniques to identify genes associated with important characteristics including biodiversity in native and introduced species.

In 2003, they released Star Lake Indian ricegrass germplasm for rangeland rehabilitation and Cashe Meadow bromegrass for forage production under limited irrigation. ARS scientists at Lincoln, Nebraska, in cooperation with scientists at the University of Nebraska, Kansas State University, USDA's Natural Resources Conservation Service, and other ARS locations released two new intermediate wheatgrass cultivars, Beefmaker and Haymaker, to help meet producers' needs in the northern Great Plains for higher-quality forages for better animal performance.

ARS scientists at College Station, Texas, in cooperation with other ARS locations and universities—including Texas A&M, Arkansas, Mississippi State, and Auburn—evaluated a new strain of dallisgrass for winter hardiness across the South. This new strain proved to be more productive and persistent than other dallisgrasses evaluated in southern Texas and Louisiana. Information gathered on winter hardiness indicates that this grass can be used as far north as central Arkansas and along the southern border of Tennessee.

## Cooperative Research, Education, and Extension Service (CSREES)

■ **Research Projects Supported by CSREES' 1890 Institution Teaching and Research Capacity Grants Program Benefit Small Farmers:** Small farmers benefit from outcomes of innovative teaching and research projects funded through CSREES' Capacity Building Grants Program, initiated in 1990 to build the institutional capacities of the 1890 Land-Grant Institutions and Tuskegee University. Funded projects involve 1890 scientists, faculty, and Extension professionals working collaboratively in targeted needy areas such as the following:

- Studies and experimentation conducted in plant and animal breeding programs to develop better crops or livestock;
- Centralized research support systems (e.g., computerized data banks on crop yields); and
- Technology delivery systems (e.g., computer-based decision support systems to assist small-scale farmers to take advantage of relevant technologies, programs, and policies).

Some examples of 1890 Capacity Building Grant projects funded in FY 2003 which benefit small farmers include:

- A research grant to North Carolina A&T State University is funding a model which uses science-based data to describe the interlinking role of community based organizations (CBOs), land-grant institutions, government agencies, businesses, and regional centers involved in poverty alleviation in the Black belt regions of the U.S. The model will help USDA programs which target the small farm community establish effective points of contact with small farmers through CBOs which have close connections with hard-to-reach small farmers and other rural community groups.

- Opportunities for small farmers, Extension professionals, and other rural residents to learn computer literacy skills are being created through a teaching grant to Lincoln University.

- A research grant to Alcorn State University will help scientists identify the most sustainable crop production practices and profitable alternative marketing channels for medicinal plants applicable to Mississippi.

- A research grant to Alabama A&M University funded the development of alternative land-use policy tools to encourage "smart growth" and minimize agricultural land loss, especially in fringe areas between rural and urban populations, by using an advanced remote sensing, geographic information system (GIS) and global positioning systems (GPS). The research will also determine the impact of land-use patterns on farm families through a survey instrument.

- A research grant to the University of Arkansas helped identify vegetable varieties and production practices for peas, fall greens, and sweet potatoes - best adapted to small farms.

- A research grant to Tennessee State University is funding a study to promote the goat meat industry in Tennessee in response to the increased demand by a fast growing ethnic population for goat meat. The promotion of the goat industry as an alternative enterprise can supplement the income of struggling small and limited resource farmers in Tennessee.

## Economic Research Service (ERS)

The National Commission on Small Farms recommended that analyses be undertaken to identify production systems, marketing approaches, and financing decisions being used by successful farming operations. ERS has responded to the Commission's recommendations by developing projects in several areas:

- **Research on Organic Agriculture:** ERS continues to carry out a program of research and data developments on the market for organic foods. Since organic markets have multiple opportunities for participants with different-sized operations, research results may assist small-scale organic producers in their marketing plans and provide information to other small-scale producers who are looking for additional marketing outlets.

In 2003, ERS published a report on the continued expansion of organic farming (ERS Agricultural Information Bulletin No. 780, U.S. Organic farming in 2000-01: Adoption of Certified Systems), an article on organic produce at farmers markets (Outlook Report No. VGS-301-01, Organic Produce, Price Premiums and Eco-Labelling at Farmers' Markets), and revised a data product on organic acreage and livestock over the 1990-2001 period. These products can all be viewed at the agency's organic farming and marketing briefing room, at www.ers.usda.gov/Briefing/Organic/.

ERS also organized a 2003 workshop on data needs in the organic sector. The Agency is currently developing a supplement on organic dairy farming to be added to the 2005 Agricultural Resource and Management Survey.

■ **Research on Contracting in Agriculture:** ERS has a program of research underway to assess the nature and scope of contracting (marketing and production contracts) in several areas of U.S. agriculture. Contracting is a growing phenomenon in U.S agriculture. The use of contracting is closely associated with large farms. Some ERS research analyses why contracting and farm size is linked, while other work assesses the effects of contracts on costs among small and large producers. Finally, some work examines the use of contracts among small producers.

In 2003, ERS researchers published a report (AER 818, February 2003) and a journal article (American Journal of Agricultural Economics, February 2003) on the effects of contracting in hog production. A major report on contracting in U.S. agriculture is in clearance, and should be released in late 2004. That report also includes an analysis of developments under the Livestock Mandatory Price Reporting of 1998, legislation specifically aimed at one concern identified in *A Time to Act*.

In 2003, ERS updated questions relating to contracting in the Agricultural Resource and Management Survey for 2003, and will incorporate data from that survey into its ongoing research program.

■ **Research on Financial Performance and Cost Structure of Farms:** ERS research aims to identify farm and farm operator characteristics that are associated with the likelihood of above average returns, defined by returns to equity and to the operator's labor and management. Other work identifies the factors driving costs and cost control among U.S. farms.

In 2003, ERS researchers completed work on an analysis of the impact of participation in cooperatives on small farms success. The research, completed as part of a cooperative agreement with Tennessee State University, found that farm size, participation in marketing and supply cooperatives, soil productivity, and certain management strategies all had a positive impact on the financial performance of small farms (The Impact of Participation in Cooperatives on the Success of Small Farms, Journal of Agribusiness, Spring 2004).

ERS is also cooperating with analysts from Penn State University to analyze the nature and extent of women's economic contributions to farm operations in the United States, including their involvement in farm tasks, farm decision-making, farm organizations, and government

agriculture programs. Preliminary results of that work appear in a chapter in the Family Farm Report.

The agency continues to release periodic electronic statistical bulletins analyzing variations in farm characteristics and production costs among producers of specific commodities. Recent releases have included reports on soybean, wheat, dairy, and rice producers. These reports can be accessed online at www.ers.usda.gov/Briefing/FarmIncome/

■ **Research Detailing the Changing Structure of U.S Farming:** ERS researchers provide frequent summary information on the structure of U.S. farming in a variety of outlets, along with detailed analyses of the small farm sector. ERS researchers published a chapter on "American Farms" in the USDA Agriculture Factbook (February 2003). The chapter highlights the changes in the size distribution of farms in the United States, while also describing the wide diversity of small farming operations in the country.

ERS researchers also completed work on a new Family Farm Report, released in 2004. The report provides summary information on the structure of farming and new research. One research chapter analyzes the relationship between unit costs and farm size among corn and soybean producers in ten major states, and finds significant cost advantages to larger sized farms. Another research chapter analyzes the factor associated with superior financial performance among farms in different size classes, and finds specific indicators of cost control that drive differences in financial performance.

In order to improve timeliness, future versions of the report will separately release research chapters and summary structural analyses.

■ **Communicating the ERS Farm Typology:** ERS analysts were involved in several activities to communicate the Farm Typology for use in thinking about farm structure and how programs might be focused to recognize differences among farms and farm households. Among these activities are:

- "Typology of America's Small Farms," presented at the Third National Small Farms Conference.
- "U.S. Farm Structure," Testimony at Hearings of Farm Credit Administration on Scope of Lending by Farm Credit System.
- "Off-farm Income Supports Many Farm Households," *Agricultural Income and Finance Outlook*.
- "Differences in Canadian and U.S. Farm structure: What the Farm Typology Shows," paper presented at the Canadian Agricultural Economics Society annual meeting.
- "Farm Structural Characteristics, Regional Economics, and Sustainability of Rocky Mountain Agriculture," presented at the Rocky Mountain Summit.

- "Financial Performance, Conservation, and Farm Diversity in the Northeast: Characteristics of Family Farm Operators and their Farms," paper presented at the Northeastern Agricultural and Resource Economics Association annual meeting.

Note: Regional analyses are necessary, because farms differ across geographic areas and national analysis does not necessarily meet the need of specific regions.

■ **Small-scale African American Farmers:** An ERS analyst conducted interviews with small-scale African American farmers in a Mississippi Delta community conducted in collaboration with Dr. Valerie Grim, Indiana University. The interviews were designed and piloted as a prototype for small interviews/case studies. The findings and methodology were reported to the USDA Small Farms Working Group, Washington, DC, in July 2002 and presented at the 3d National Small Farms Conference in Albuquerque, New Mexico, in September 2002 under the title "Helping Farmers Succeed: Conversations with Small-Scale African-American Operators in the Mississippi Delta."

The long-term research collaboration with Dr. Grim, Indiana University, that facilitated the above research also supported a presentation titled "Connecting the Past, Present, and Future: Oral History in an African-American Farming Community" at the Oral History Association meeting in Bethesda, Maryland, in October 2003. The presentation described the development of a collection of interviews with members of a small African-American farming community in the Mississippi Delta region, which both captured the remembered past of the community and strengthened and extended the community's efforts to protect their future by addressing current problems.

## National Agricultural Statistics Service (NASS)

The mission of the National Agricultural Statistics Service (NASS) is to provide timely, accurate, and useful statistics in service to U.S. agriculture. To achieve this, NASS administers the USDA's program of collecting and publishing current national, State, and county agricultural statistics. In addition to the annual statistics program, NASS conducts the Census of Agriculture every 5 years.

■ The census of agriculture provides a detailed look at agriculture in each of the Nation's 3,000 plus counties and is the only source of uniform agricultural data for every county in the United States. Statistical data provided by NASS are essential to both the public and private sector, including small farmers, ranchers, and the socially disadvantaged groups for all types of agricultural planning and decision-making.

■ NASS publishes the Agricultural Statistics Board Calendar annually which lists all the NASS reports released during the calendar year. All of the reports are available on the NASS home page at www.usda.gov/nass/, or for additional information contact the Agricultural Statistics Hotline 1-800-727-9540.

■ A preliminary release of demographic data collected by the 2002 Census of Agriculture was released on February 3, 2004, and the final United States Summary and State Data tables were

issued on June 3, 2004. The 2003 Farm and Ranch Irrigation Survey and the Census of Aquaculture are two special studies conducted by NASS to supplement the census data and to provide more detailed information on certain farm sectors.

**Small Farmers Initiative/Activities and Socially Disadvantaged Groups:**

- NASS works closely with USDA's Small Farms Coordination, Office of the Under Secretary for Research, Education and Economics (REE) to provide statistical and demographic information, as needed, relating to small farms and socially disadvantaged groups issues and other associated Departmental/REE initiatives.

- NASS continues to evaluate its list of farm and ranch operations using its updating procedures to ensure coverage of the Nation's small farms and ranches and minority operators of farms and ranches. NASS has become increasingly aware of the ever-increasing number of refugees who are engaged in farming and agribusiness across the United States. Its staff is working with an interdepartmental group, Community and Faith Based Organizations, to identify farm operators and add them to the Nation's farm and ranch list, known as the List Frame. The List Frame serves as the foundation for NASS' annual survey program and the Census of Agriculture.

- NASS staff engaged in collaboration with other USDA agencies and the Office of Outreach, Land-Grant Institutions, and Community Based Organizations to increase the 2002 Census of Agriculture response rate of small farms and ranches and minority operators of farms and ranches. This effort was highly successful. NASS staff continues to assist the USDA Office of Outreach and the Farm Service Agency in their efforts to implement the Minority Farm Register, which was recommended in the 1997 Civil Right Action Team (CRAT) report.

The register will be a voluntary list of minority farm operators and/or owners and is being created to provide an additional tool for USDA to comply with Section 10708 of the 2002 Farm Bill: Transparency and Accountability for Socially Disadvantaged Farmers and Ranchers. The Minority Farm Register will also provide an additional tool to help USDA improve its Outreach and Technical Assistance Program for Socially Disadvantaged and Minority Farmers.

- NASS and the Economic Research Service (ERS) staff completed review of the Agricultural Resources Management Study (ARMS) specifications and questionnaire content for the ARMS III survey. This survey is conducted in cooperation with ERS and focuses on cost of production data for targeted commodities, chemical use, and farm finances.

The ARMS results are included in several ERS reports including "Income, Wealth, and the Economic Well-Being of Farm Households," and "Agricultural Resources and Environmental Indicators: Land Ownership and Farm Structure". Both reports were released by ERS in June 2002.